CLAIMS

What is claimed is:

1. An optical amplifying apparatus comprising:

optical amplifying means for amplifying a wavelength-division multiplexed optical signal wherein a plurality of optical signals having different wavelengths are wavelength-multiplexed; and

input light controlling means for inputting, to said optical amplifying means, probe light that serves to keep the optical power of light to be input to said optical amplifying means constant in accordance with a change in the number of optical signals of said wavelength-division multiplexed optical signal.

2. An optical amplifying apparatus according to claim 1, wherein said input light controlling means comprises:

a light source for generating probe light;

combining means for inputting said probe light to said optical amplifying means;

detecting means for detecting the optical power of light to be input to said optical amplifying means; and

controlling means for controlling the optical power of said probe light so that the output from said detecting means becomes approximately constant.

3. An optical amplifying apparatus according to claim 1, further comprising rejecting means for eliminating said probe light from light amplified by said optical amplifying means.

4. An optical amplifying apparatus according to claim 2, wherein said light source generates probe light wherein laser beams having different wavelengths are wavelength-multiplexed.

5. An optical amplifying apparatus according to claim 2, wherein:

said light source is a semiconductor laser; and

said controlling means controls the optical power of said probe light by adjusting a driving current of said semiconductor laser, so that the output from said detecting means becomes approximately constant.

6. An optical amplifying apparatus according to claim 2, wherein said controlling means is an optical attenuator for attenuating the optical power of said probe light output from said light source.

7. An optical amplifying apparatus according to claim 2, wherein said controlling means is an optical amplifier for amplifying the optical power of said probe light output from said light source.

8. An optical amplifying apparatus according to claim 2, further comprising a memory for storing the maximum operable multiplex number of said wavelength-division multiplexed optical signal, and wherein

said controlling means controls the optical power of said probe light based on a difference between a value of the output from said detecting means and a reference value greater than or equal to the value of the output from said detecting means that is obtained when a number of multiplexed optical signals in said wavelength-division multiplexed optical signal is equal to the maximum operable number.

9. An optical amplifying apparatus according to claim 2, further comprising a weighting filter provided prior to said detecting means so set that it has the maximum transmittance rate at the central wavelength in a gain band or at the wavelength of a maximum gain of said optical amplifying means, and whose transmittance rate decreases as a difference between the wavelength of said probe light and the central wavelength increases.

10. An optical add/drop multiplexer comprising:

dropping means for dropping an optical signal having a specific wavelength from a wavelength-division multiplexed optical signal wherein a plurality of optical signals having different wavelengths are wavelength-multiplexed;

adding means for adding an optical signal having a specific wavelength to said wavelength-division multiplexed optical signal from which said optical signal is dropped by said dropping means; and

an optical amplifying apparatus comprising optical

amplifying means for amplifying said wavelength-division multiplexed optical signal and input light controlling means for inputting, to said optical amplifying means, probe light that serves to keep an optical power of light to be input to said optical amplifying means constant in accordance with a change in the number of optical signals of said wavelength-division multiplexed optical signal, and

wherein at least one said optical amplifying apparatus is respectively provided prior to said dropping means, between said dropping means and said adding means, and subsequent to said adding means.

11. An optical add/drop multiplexer according to claim 10, further comprising optical power adjusting means, between said dropping means and said adding means, for adjusting an optical power of light to be input to said adding means.

12. An optical add/drop multiplexer according to claim 10, further comprising:

dropped optical signal receiving means for receiving and processing said optical signal dropped by said dropping means; and

added optical signal sending means for generating an optical signal to be added by said adding means.

13. An optical add/drop multiplexer according to claim 10, wherein said input light controlling means comprises:

a light source for generating probe light;

combining means for inputting said probe light to said optical amplifying means;

detecting means for detecting the optical power of light to be input to said optical amplifying means; and

controlling means for controlling the optical power of said probe light so that the output from said detecting means becomes approximately constant.

14. An optical add/drop multiplexer according to claim 13, further comprising optical power adjusting means, between said dropping means and said adding means, for adjusting an optical power of light to be input to said adding means.

15. An optical add/drop multiplexer according to claim 13,

further comprising:

dropped optical signal receiving means for receiving and processing said optical signal dropped by said dropping means; and

added optical signal sending means for generating an optical signal to be added by said adding means.

16. An optical add/drop multiplexer according to claim 13, further comprising rejecting means for eliminating said probe light from light amplified by said optical amplifying means.

17. An optical amplifying apparatus according to claim 13, wherein said light source generates probe light wherein laser beams having different wavelengths are wavelength-multiplexed.

18. An optical add/drop multiplexer according to claim 13, wherein:

said light source is a semiconductor laser; and

said controlling means controls the optical power of said probe light so that the output from said detecting means becomes approximately constant by adjusting a driving current of said semiconductor laser.

19. An optical add/drop multiplexer according to claim 13, wherein said controlling means comprises an optical attenuator for attenuating the optical power of said probe light output from said light source.

20. An optical add/drop multiplexer according to claim 13, wherein said controlling means comprises an optical amplifier for amplifying the optical power of said probe light output from said light source.

21. An optical add/drop multiplexer according to claim 13, further comprising a memory for storing the maximum operable multiplex number of said wavelength-division multiplexed optical signal, and wherein said controlling means controls the optical power of said probe light based on a difference between a value of the output from said detecting means and a reference value greater than or equal to the value of the output from said detecting means that is obtained when a number of multiplexed optical signals in said wavelength-division

multiplexed optical signal is equal to the maximum operable number.

22. An optical add/drop multiplexer according to claim 13, further comprising a weighting filter provided prior to said detecting means so set that it has the maximum transmittance rate at the central wavelength in a gain band or at the wavelength of maximum gain of said optical amplifying means, whose transmittance rate decreases as a difference between the wavelength of said probe light and the central wavelength increases.

23. An optical amplifying method, comprising the steps of:

combining input light with probe light having an optical power corresponding to a difference between a prescribed reference value and a value of the optical power of the input light; and

amplifying the combined light.

24. An optical amplifying method of amplifying a wavelength-division multiplexed optical signal wherein a plurality of optical signals having different wavelengths are wavelength-multiplexed, comprising the steps of:

controlling an optical power of probe light to be input to optical amplifying means for amplifying said wavelength-division multiplexed optical signal in accordance with an increase or a decrease in the number of channels of said wavelength-division multiplexed optical signal; and

keeping an optical power of light to be input to said optical amplifying means approximately constant.